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Vývoj trhu zelených dluhopisů v Číně
The Development of Green Bond Market in China

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List of Abbreviations
Declaration of Utilisation of Results from the Bachelor Thesis
List of Annexes
Annexes

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The declaration

I hereby declare that I have elaborated the entire thesis including annexes myself.

Ostrava dated 04.05.2018

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Contents

1 Introduction

Chinese economic growth is very rapid. More than 1 billion people have got rid of poverty in the last 30 years. But the cost behind this growth is also becoming more and more apparent such as air pollution, river pollution, greenhouse gas emissions and so on. The environmental pollution has a bad influence on human health, ecosystems and climate change. In response to environmental challenges, green financial become one of the main ways to solve them.

The main aim of this thesis is to evaluate the current bond market in China, the policy and development of the Chinese green bond market, compare domestic and foreign definitions and standards of green bond, and to assess the main role of green bonds in China.

The thesis is divided into five chapters. The first chapter is the introduction which introduces the main goal of this thesis and research directions of this topic.

The second chapter is characteristics of bond securities. It includes the definition of financial market, the characteristics of bonds, the types of bonds, the development of bonds and the risk of bonds.

The third chapter is the role of green bond market. We focus on the international green bond market. The definition of green bond, the standards of green project, the development of green bond and the way to issue green bond.

The fourth chapter is assessment of the green bond market development in China. In this chapter, the focus will be on the Chinese green bond market. For example, to analysis the development of green bond in China by describing data and policies and to assess the development trend of green bond market in China by analyzing the major problems in the Chinese green market and corresponding measures. A partial objective of this chapter is to compare the green bond and the dual currency bond issued by the China Three Gorges Corporation.

The last chapter is conclusion, it is a summary of knowledge and conclusions implied by this thesis. Although the green bond market has just started in China, it faces many difficulties. In order to solve environmental problems faster and better, all sectors of the community make an effort. With the support of the Chinese government's policy, the brave attempt of financial institutions, the better system of regulatory agencies, the popularization of the environmental awareness. They will help the healthy development of China's green financial market. And the Chinese green bond market will have a far-reaching impact and significance on the international green bond market.

2 Characteristics of Bond Securities

The financial market is an important part in finance. And the bond market is an important part in the financial market. So it's necessary to know what the financial market is. In this chapter, we will focus on the definition of financial market, bonds and bond market.

2.1 Definition of Financial Market

From ancient times to today, the economists from all countries think that financial market is crucial to economic and finance. Financial markets are the places where financial instruments are bought and sold. They are the economy's central nervous system, relaying and reacting to information quickly, allocating resources, and determining prices (Stephen, 2011).

According to this definition, the role of financial markets is clearly. Firstly, financial markets provide opportunity to investors and financiers, make the assets liquidity. Secondly, financial markets offer the information to all financial markets participants. Finally, it allows the risk sharing, it means financial markets allow participants buy or sell the financial instruments, there are lots of participants, they can share the risk.

Next is about financial markets structure, there are so many ways to classification. There are four possibilities.

1. The primary markets and secondary markets by where the new financial instruments issued and where them resold and traded. The primary markets are the new financial instruments issued. For example the first public issue of stocks are sold by a firm is called initial public offering. And the secondary markets are resold and traded for those financial instruments which have been already issued.
2. The centralized exchanges and over-the-counter markets by the way they trade financial instruments. The centralized exchanges are the traded is concentrated on a specific exchange. The over-the-counter markets is not concentrated traded, it

can through telephone and computer network connecting dealers.

3. The debt markets, equity markets and derivatives markets by the types of instruments they trade. The bank loans, mortgages and bonds belong to the debt markets. The stocks belong to equity markets. And futures, options, and swaps belong to the derivatives markets.
4. Money markets and capital markets by financial instruments maturity date. The money markets are for short-term financial instruments trade, it is less than or equal to one year. And the capital markets are for the long-term financial instruments trade, for example long-term loans, bonds.

2.2 Characteristic of Bonds

In this part, the attention is paid to the definition of bonds and the main parameters of bonds.

A security is a claim on the issuer's future income or assets. A bond is a debt security that promises to make payments periodically for a specified period of time (Frederic, 2007). According to this, we can say a bond is the financial deficit issued to transfer the money from the financial surplus, after a pre-specified period, the issuers need to paid back to the bondholders both principal and interest.

Next are the main parameters of bonds.

- Face Value

Face value is the nominal value or dollar value of a security stated by the issuer. For bonds, it is the amount paid to the holder at maturity, generally $1,000. It is also known as "par value" or simply "par".[1]

Face value is a specified final amount of money a holder will get back once a bond matures. A newly issued bond usually sells at the face value. For corporate bonds the face value is $1,000, and for government bonds the face value is bigger than this normally.

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[1] https://www.investopedia.com/terms/f/facevalue.asp#ixzz54vRg5rRr

- Coupon Rate

The bond's coupon rate is the dollar amount of the yearly coupon payment expressed as a percentage of the face value of the bond (Frederic, 2007). For example, there is a bond with $1,000 face value, and the coupon rate is 5%, the coupon payment will be 1,000•5%, it's equal to $50. This $50 is coupon payment of this bond. There are two types of coupon rate. One is straight fixed rate, it means the coupon rate will be same at the whole period. Another one is floating rate, it will change during the time, and the causes of it change are inflation, interest rate.

- Maturity

Maturity is the date on which the life of a transaction or financial instrument ends, after which it must either be renewed or it will cease to exist.[2]

This maturity date is in the future, and the bondholders can receive their principal when the maturity date comes. The maturities can range from one day to 30 years. In general, the longer the time to maturity, the higher the interest rate.

- Yield to Maturity

The most useful measure of the return on holding a bond is called the yield to maturity, or the yield bondholders receive if they hold the bond to its maturity when the final principal payment is made (Stephen, 2011). Same as the above example, the $1,000 face value 5 percent coupon bond with one year to maturity. At maturity, the bondholder receives $50 coupon payment (C) plus $1,000 principal (F). According to this formula, the price of this bond can be calculated as

$$P = \frac{C+F}{1+i} \tag{2.1}$$

where the " i " is the yield to maturity.

2.3 Types of Bonds

There are so many ways to classification the bonds. In this chapter, we will use five ways to describe the types of bonds.

[2] https://www.investopedia.com/terms/m/maturity.asp#ixzz54vWzFvFK

1. The major types of bonds by different issuers:

a) Treasury notes and bonds

They are issued by the government, it is for financing the national debt and other government expenditures. The treasury bonds have fixed-interest and their maturity is more than 10 years. The T-notes also have fixed-interest, but the maturity is between one to ten years. And they usually make interest payments annually or semi-annually. They are less risk because the government default risk is very small.

b) Municipal bonds

This bond is a debt security issued by state, counties, cities and local governments. The funds received by this bond used to municipality or county's capital expenditures. For example, transportation systems, schools and public utility construction. Tax receipts or revenues from a project are source of repayment on municipal bonds. In some countries, this bonds are attractive to the people who have high income tax brackets, because municipal bonds are exempt from federal taxes and from most state and local taxes.[3]

c) Corporate bonds

A bond issued by a company and sold to investors is corporate bonds. The payment ability of the company, which is typically money to be earned in the future is source of repayment on corporate bonds. And purchasing bonds from well-known company is better than purchasing bonds from a company in financial trouble, because the well-known company has less risky. Generally, corporate bonds offer a slightly higher yield than government bonds, because they have higher default risk than government bonds.

2. By the different way to payment:

a) Zero bonds

Zero-coupon bond doesn't pay a coupon; it means this bond makes no periodic interest payments. But it is traded at a deep discount from its face value, when the

[3] http://www.municipalbonds.com/tax-education/tax-exemption-from-state-income-taxes/

bond is redemption for its full face value will gain profit at the maturity.

b) Coupon bonds

A coupon bond, also referred to as a bearer bond, is a debt obligation with coupons attached that represent semi-annual interest payments.[4] In general, coupon bonds' issuers do not record the information about buyers. And the buyers' names do not be written on the bonds. At maturity the bondholders get the payment.

c) Discount bonds

A discount bond is a bond that is issued for less than its face value, or a bond currently trading for less than its par value in the secondary market.[5] And generally, a newly issued bond sells at the face value.

3. By whether the interest rate changes:

a) Fixed rate bonds

The interest is always same, investors can know how much they can get back clearly.

b) Floating rate notes

The interest rate may be change, a floating rate note's interest rate, since it is not fixed, is tied to a benchmark such as the U.S. Treasury bill rate, the fed funds or the prime rate. Floaters are mainly issued by financial institutions and governments, and they typically have a two- to five-year term to maturity.[6]

4. By different maturity:

a) Long-term bonds

The long-term bonds have long repayment period, usually more than ten years.

b) Medium-term bonds

The medium-term bonds' repayment period between long-term bonds and short-term bonds, usually range from one to ten years.

c) Short-term bonds

For the short-term bonds, the repayment period is less or up to one year.

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[4] https://www.investopedia.com/terms/c/couponbond.asp#ixzz54whuJUP2
[5] https://www.investopedia.com/terms/d/discountbond.asp#ixzz54wj5HNCj
[6] https://www.investopedia.com/terms/f/frn.asp#ixzz54wlHxElk

5. By different way to raise funds:

a) Public bonds

This type of bond is used by municipalities to finance public works facilities and improvements.[7] The purpose of public bonds is for the public such as school, hospital, transportation systems.

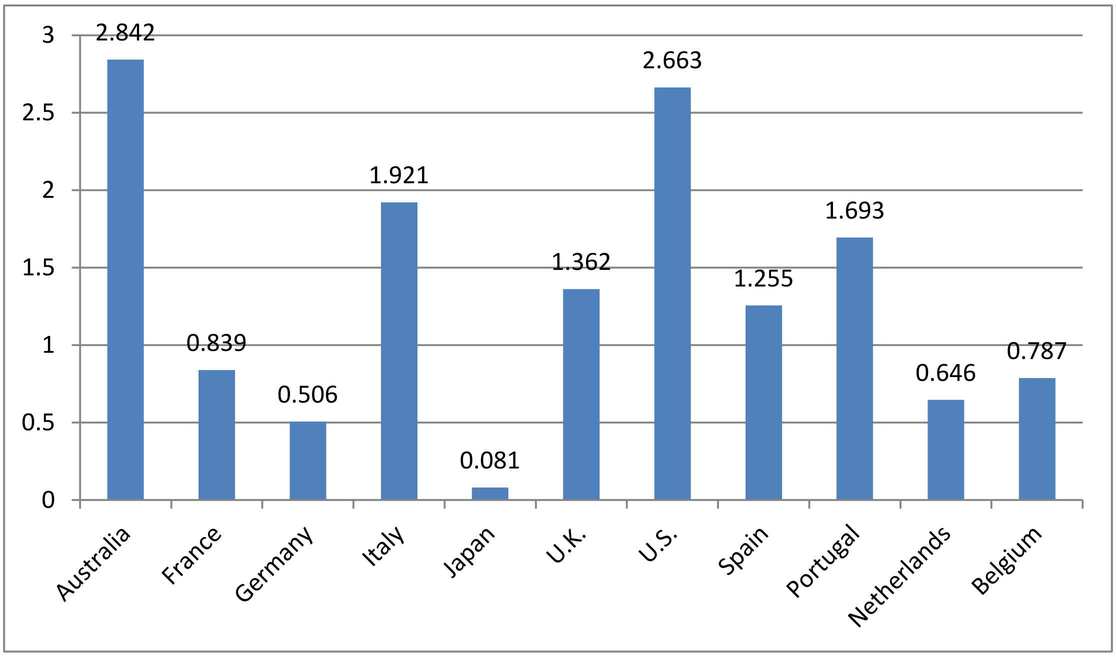
b) Private bonds

A type of municipal bond that is issued to finance a project for which at least 10% of the benefit will go to a private sector entity.[8] The purpose of private bonds is for a specified project, not for the public.

2.4 The Development of Bond Markets

After the types of bonds, this chapter is about the bond markets development and history of some selected countries' bond markets.

Figure 2-1 Ten years government bonds yield (%)-2018



Source: The Wall Street Journal, Author

As figure 2-1, the characteristics of the development of international bond markets are:

[7] https://www.investopedia.com/terms/p/public-purpose-bonds.asp#ixzz54wo78QFP
[8] https://www.investopedia.com/terms/p/ppb.asp#ixzz54wpHolTR

1. The main bodies of financiers in bond market are always the developed countries, and the developing countries accounted for a small percentage.
2. The structure of the international bond type changed too.
3. Emerging markets countries are very active, and the main of issuer is the government.

The major of international bonds in the world and their histories:

a) The United States: Yankee bond

Yankee bond is issued by a foreign bank or company, and it's issued in the United States. It's also traded in the United States, the currency is dollar too. It registered at the Securities and Exchange Commission before traded. And the number of Yankee bond issued is large, the liquidity is high. The term of Yankee bond is long, the mid of 1970s it generally 5 to 7 years, after the mid of 1980s it can reach 20 to 25 years. The issuers are institutional investors, such as national governments, international agencies, and foreign banks. And the mainly buyers are the United States commercial banks, saving banks and insurance companies. It is pay attention to the rating, because the rating can affected the sales.

b) Japan: Samurai bond

Samurai bond is a bond which denominated by Japan yen. And it's issued in Tokyo by a foreign company; it is unsecured, the typical duration of 3 to 10 years. The first Samurai bonds were issued by the Asian Development Bank in December 1970, the issuers were mainly international agencies at beginning. Japanese international balance of payments worse so that the issuance of Samurai bond was interrupted between 1973 to 1975. After the 1980s, the number of Samurai bond issuance is increased.

c) Switzerland: Swiss foreign bond market

The Swiss foreign bond market is the largest foreign bond market in the world. It is a bond which issued by foreign agencies in Switzerland and denominated with Swiss franc. The issuance of Swiss francs foreign bonds is divided into public and private.

United Bank of Switzerland and Credit Suisse are underwriters of public bonds, private bonds don’t have fixed underwriters. The Switzerland government does not allow the notes of Swiss franc bonds to appear abroad.

2.5 Credit Risk of Bonds

According to the Wall Street Journal, bonds look attractive now but they come with risks. So the bonds are risky. Bondholders face three major risks (Stephen, 2011).

- Default risk is the chance that the bond’s issuer may fail to make the promised payment.
- Inflation risk means an investor can’t be sure of what the real value of the payments will be, even if they are made.
- Interest-rate risk arises from a bondholder’s investment horizon, which may be shorter than the maturity of the bond.

So how can we decrease the risk of bonds? Here has a way to decrease default risk is rating. Next this chapter will focus on bonds rating.

2.5.1 Definition of Rating

A bond rating is a "grade" assigned to a bond. In investment, the bond credit rating represents the credit worthiness of corporate or government bonds. The ratings are published by credit rating agencies and used by investment professionals to assess the likelihood the debt will be repaid.[9]

A credit rating can be assigned to any entity that seeks to borrow money, for example an individual, corporation, state or provincial authority, or sovereign government. Credit assessment and evaluation for companies and governments is generally done by a credit rating agency such as Standard & Poor’s, Moody’s or Fitch. These rating agencies are paid by the entity that is seeking a credit rating for itself or for one of its debt issues.

9 https://www.investopedia.com/terms/b/bondrating.asp

Moody's was the first agency to issue publicly available credit ratings for bonds, in 1909, and other agencies followed suit in the decades after. These ratings didn't have a profound effect on the market until 1936, when a new rule was passed that prohibited banks from investing in speculative bonds, or those with low credit ratings, to avoid the risk. This practice was quickly adopted by other companies and financial institutions, and relying on credit ratings became the norm.

2.5.2 Importance of Rating

1. Rating agencies examine the companies' operating ability

When assigning a rating for a corporation's debt, the rating agencies look at the company's history of repayment, its income and assets and its other liabilities. If the company scores well on these elements, its bonds will get an "investment grade" rating.

2. Investors will consider rating when purchasing bonds

Investors are mindful of the bond rating, but it's only one factor they consider. What a ratings downgrade tells investors is that there is something in a public company's reported data that gives the ratings agency pause. It suggests there's something to be concerned about. So it's very important for investors.

3. Reduce asymmetric information

The financial market is getting stronger, and the financial product structure is more and more complicated, that make the asymmetric information problem become more and more serious. As the financial products continue to innovate, it becomes more difficult for issuers, investors and regulators to understand the risks of financial products clearly. The rating agencies through assessment financial products' risk, guide the financial capital make decisions and investments. And determine the pricing standards for financial products.

2.5.3 Rating and Bond Yield

Standard & Poor's (S&P) and Moody's are the major independent rating agencies that look into bond issuers.

If the bond rating is good, the company is strong enough to pay its obligations, which include expenses, payments on debts, and dividends. If a bond rating agency gives the company a high rating (or if it raises the rating), that's a great sign for anyone holding the company's debt or receiving dividends. Conversely, a lowered rating indicates the company's financial health is deteriorating, while a bad bond rating means the company is having difficulty paying its obligations.

And the less creditworthy the borrower, the higher the risk of default, the lower the borrower's rating, the higher cost of borrowing, it means the lower the rating of the bond, the higher of the yield.[10]

Table 2-1 The rating assignments for both investment-grade and below-investment-grade debt

Credit Risk	Moody's	S&P	Fitch
Investment grade			
Highest quality	Aaa	AAA	AAA
High quality(very strong)	Aa	AA	AA
Upper medium grade(strong)	A	A	A
Medium grade	Baa	BBB	BBB
Not investment grade			
Lower medium grade	Ba	BB	BB
Low grade(speculative)	B	B	B
Poor quality(may default)	Caa	CCC	CCC
Most speculative	Ca	CC	CC
No interest being paid or bankruptcy petition filed	C	D	C
In default	C	D	D

[10] https://www.investopedia.com/terms/c/creditrating.asp#ixzz54x8eBYrO

Source: Moody's, S&P, Fitch rating, Author

Table 2-1 describes the rating assignments for both investment-grade and below-investment-grade debt in different rating agencies.

Bond ratings are designed to reflect default risk and investors require compensation for risk. The less creditworthy the borrower, the higher the risk of deault, the lower the borrower's rating, the higher cost of borrowing, it means the lower the rating of the bond, the higher of the yield. For example, suppose a company that qualifies for the highest rating (AAA/Aaa) issues a 10-year bond with a yield of 6%. To compete for capital, a company rated single-B may need to offer a yield of 9% to 11%.

To entice investors and to compensate them for the attendant risks, issuers with lower-rated credits must pay a higher rate of interest than companies whose bonds are given an investment-grade rating. This in turn generates a higher "yield" for investors.

3 The Role of Green Bond Market

In recent years, the development of green bond market is getting faster and better, the role of green bond market has become an important theme for the study of economists in various countries. So in this part, we will pay more attention into the role of green bond market.

3.1 Definition of Green Bond

Green bond is short for qualified green building and sustainable design project bond.[11] Green bonds are any bond instruments that specifically finance the acquisition of eligible green projects or the refinancing of these projects. Compared with ordinary bonds, green bonds are mainly in four aspects: the use of bonds to raise funds, the evaluation and selection of green projects, the follow-up management of funds raised and the requirements issued by the relevant annual reports. Green bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, the new and/or existing eligible green projects (ICMA, 2017). It means the assets or business activities are environment-friendly, and the funds raised from green bonds are mainly targeted at the low-carbon economy, circular economy, and ecological economy. According to the climate bond standards by climate bond initiative, the sector criteria available for certification projects in areas such as water, solar, wind, low carbon buildings, low carbon transport and geothermal. Exclude fossil energy projects from green projects, and does not include new energy vehicles and fuel upgrades either. But in China, the green projects including the clean use of coal, oil; including new energy vehicles and fuel upgrades.

Next is about the types of green bond, according to the green bond principles 2017, we sum up the following table 3-1:

[11] https://www.investopedia.com/terms/g/green-bond.asp

Table 3-1 Types of Green Bond

Type	Use of proceeds	Debt recourse
Standard Green Use of Proceeds Bonds	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds
Green Revenue Bond	Earmarked for or refinances green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt
Green Project Bond	Ring-fenced for the specific underlying green projects	Recourse is only to the project's assets and balance sheet
Green Securitised Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together

Source:
https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/GreenBondsBrochure-JUNE2017.pdf, Author

From table 3-1 we can get that Standard Green Use of Proceeds Bonds: EIB "Climate Awareness Bond" (backed by EIB). Green Revenue Bond: Hawaii State (backed by fee on electricity bills of the state utilities). Green Project Bond: Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm). Green Securitized Bond: Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages).

The current international recognition is based on the Green Bond Principles by ICMA. There are four core element about green bond (GBP, 2017) :

1. Use of Proceeds

Clearly raised funds can only be used for green projects and must have practical and beneficial impact on environmental sustainability. The standard of green projects has been briefly described at the above. But in the green bond principles, every green projects may relate to more than one category. There is a list, and the categories include, but are not limited to:

• Renewable energy (including production, transmission, appliances and products);

• Energy efficiency (such as in new and refurbished buildings, energy storage, district heating, smart grids, appliances and products);

• Pollution prevention and control (including waste water treatment, reduction of air emissions, greenhouse gas control, soil remediation, waste prevention, waste reduction, waste recycling and energy/emission-efficient waste to energy, value added products from waste and remanufacturing, and associated environmental monitoring);

• Environmentally sustainable management of living natural resources and land use (including environmentally sustainable agriculture; environmentally sustainable animal husbandry; climate smart farm inputs such as biological crop protection or drip-irrigation; environmentally sustainable fishery and aquaculture; environmentally-sustainable forestry, including afforestation or reforestation, and preservation or restoration of natural landscapes);

• Terrestrial and aquatic biodiversity conservation (including the protection of coastal, marine and watershed environments);

• Clean transportation (such as electric, hybrid, public, rail, nonmotorised, multi-modal transportation, infrastructure for clean energy vehicles and reduction of harmful emissions);

• Sustainable water and wastewater management (including sustainable infrastructure for clean and/or drinking water, wastewater treatment, sustainable urban drainage systems and river training and other forms of flooding mitigation);

• Climate change adaptation (including information support systems, such as climate observation and early warning systems);

• Eco-efficient and/or circular economy adapted products, production technologies and processes (such as development and introduction of environmentally friendlier products, with an eco-label or environmental certification, resource-efficient packaging and distribution);

• Green buildings which meet regional, national or internationally recognised standards or certifications. (International Capital Market Association, 2017)

2. Process for Project Evaluation and Selection

The issuer needs to establish a project evaluation and screening process, including but not limited to: establishing a qualified green project pool, clarifying the project evaluation and screening process, and determining the environmental benefits target.

3. Management of Proceeds

The raised funds shall be transferred to a special account newly established or designated, and a sound control system shall be established to ensure that the investment of the funds raised from the green bonds can be traced back. Ensure that during the entire life of the green bonds, the raised funds will not be deliberately invested in non-green projects.

4. Reporting

The issuer should disclose the use of funds raised from green bonds and the expected environmental benefits and implementation of the fund-raising projects at least once a year. Encourage the regular disclosure of the green benefits of fundraising projects through qualitative and quantitative indicators such as reduced greenhouse gas emissions, increased use of clean energy, reduced vehicle usage. And there are two ways to certify securities as green bond issuance: one is the issuer and the lead underwriter identify themselves and provide relevant instructions for the "green" property of the fundraising project; another one is engage external agencies to certify the project's "green" attributes and issue independent opinions. It is called ‘external review’ in the Green Bond Principle, and its forms include:

a) consultant review: green certified industry experts seek advice on green project evaluation and selection;
b) verification: give some independent opinions on the internal process and fund management system of the green bond issuer by some intermediary agency such as an auditor;
c) certification: authenticated third-party agencies to verify the "green" attributes and express their opinions, internationally more authoritative third-party certification agencies include Centre for International Climate and Environmental Research (CICERO), Vigeo Eiris, Det Norske Veritas (Norway) and Germanischer Lloyd (Germany) and Climate Bond Initiative;
d) Rating.

In addition, the Climate Bond Principle by CBI is also recognized in the world. It differs from the Green Bond Principle by ICMA in the confirmation of green projects. The currently certified bonds include the following: solar energy, wind energy, low-carbon buildings, rapid transit systems and low-carbon transportation. And the classification in the low-carbon field has been refined in the Climate Bond Principle.

In order to enhance the credibility of green bonds, solve investors concerns, we need to certify green bonds like external review.

3.2 The Development of Green Bond Market

After the definition, next we will focus on the development of green bond. At this chapter, it is include green bonds' history, current situation and future development trend.

3.2.1 The History of Green Bond

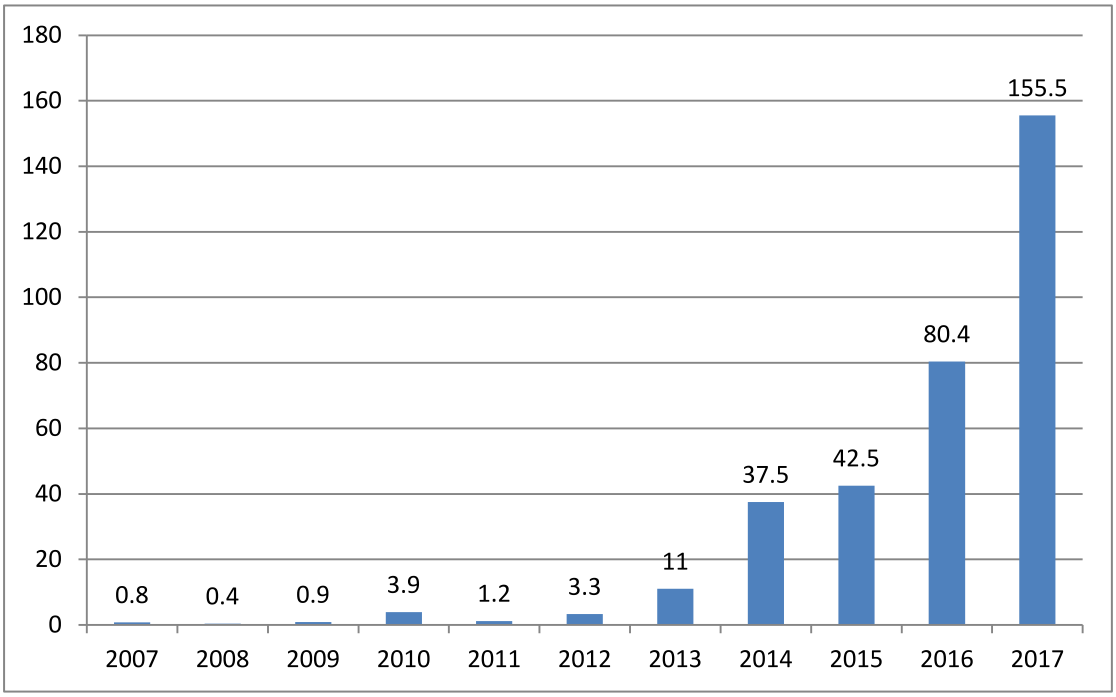
The first environmental-protected bond is "Climate Awareness Bond" issued by the European Investment Bank in June, 2007. This bond is a five-year period bond, raised funds 600 million euro. After that, World Bank, International Finance Corporation, European Bank for Reconstruction and Development, African Development Bank and other international multilateral financial institutions or development banks have successively issued green bonds.

In 2008, the World Bank and Skandinaviska Enskilda Banken (SEB) jointly issued the first bond named “Green Bond”. In March 2012, French issued the first green municipal bond, raised fund 350 million euro. In February 2013, Export-Import Bank of Korea (KEXIM) became the first financial institution to issue green bond in Asia. In November 2013, the French Electric Power Company (EDF) and the Swedish real estate company Vasakronan became the first company to issue green bond in the world (CBI, 2014).

3.2.2 The Current Situation of Green Bond Market

Green bonds differ from the ordinary bonds in that they ultimately invest in green projects. It is a new type of bond that has emerged in the international bond market in recent year because of investors around the world who are concerned about climate change and environmental issues. Funds raised from green bonds will be specifically used for projects that can achieve mitigation and adaptation to climate change.

Figure 3-1 Total global green bond issuance from 2007 to 2016 (unit: USDBn)



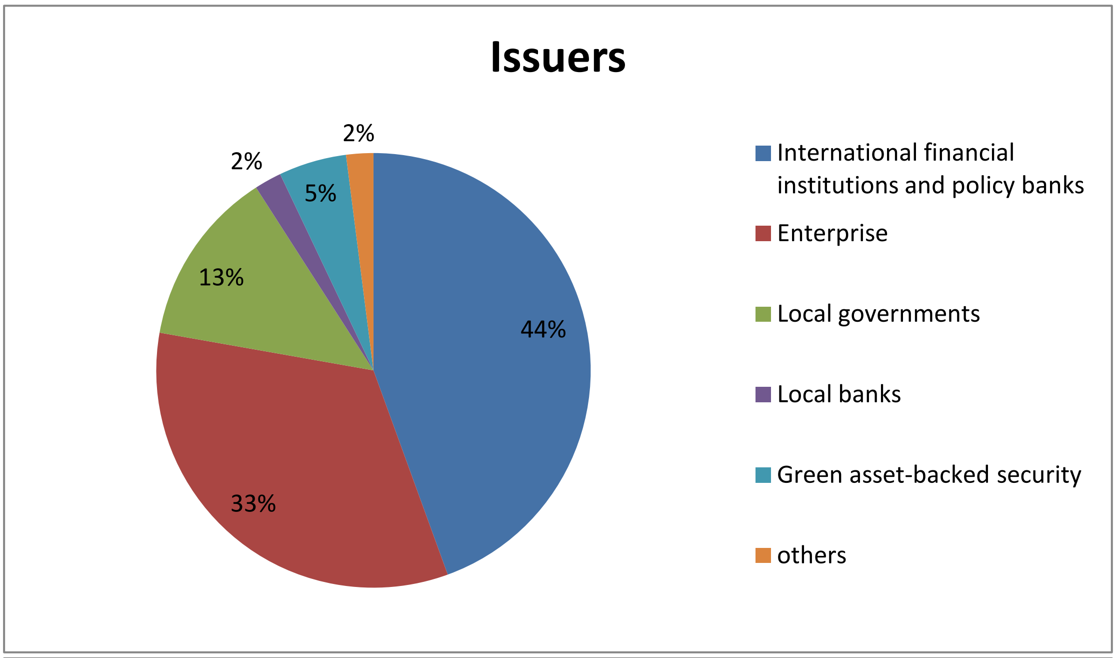
Source: NAFMII-ICMA Working Group, Author

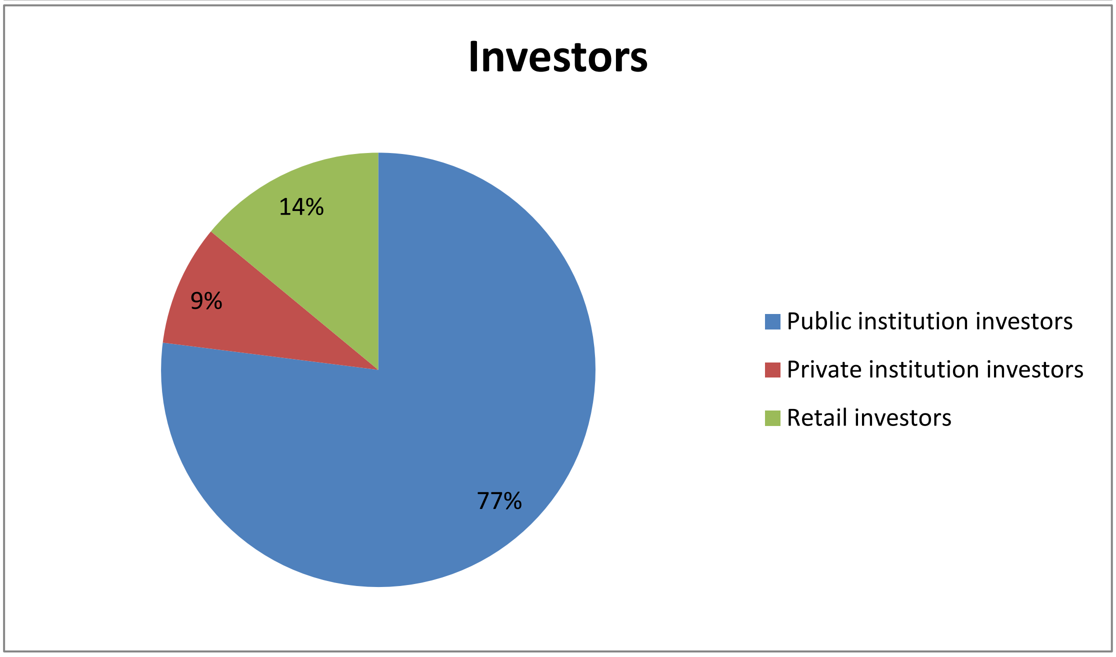
As we can see at figure 3-1, the issuance of green bond is increasing in the past five years. In other words, it is the rapid development of the green bond market. The annual amount of green bonds has risen from 11 billion USD in 2013 to 37.5 billion USD in 2014 and 42.5 billion USD in 2015, and reached 80.1 billion USD in 2016, which is approximately 200% of that in 2015. In 2017, it's already more than 100 billion USD.

Next is about the issuer and investor of green bond. With the development of the global green bond market, the issuer of green bonds has also developed from a policy-oriented financial institution towards diversification. At present, government agencies, international agencies, multilateral financial institutions, investment banks, and large-scale enterprises have all become major issuers. And major investors of green bonds are public institution investors, private institution investors and retail investors.

We can see the distribution of issuers and investors in the figure 3-2.

Figure 3-2 The distribution of issuers and investors





Source: China Green Finance Committee, Author

Next is the climate theme of green bond. The transport and energy are the largest climate theme. According to the Bonds and Climate Change Report in 2016 by Climate Bonds Initiative, transport making up 66.8% of all bonds outstanding. Energy is second one, accounting for 18.8% of the amount outstanding. Then, the rating of green bond, 15% of them got AAA, 37% got AA, 16% got A, 10% got BBB. So it means 78% of them is investment grade, in addition, 16% no rating.

The last is top 3 countries of issue green bonds: China, the United States and France.

1. China

The amount of green bonds from China accounting 36% of all bonds outstanding. And now, China is the world's largest green bond issuer in 2016. It issued more than 220 billion USD, and 76% of the green bonds are in the transport theme. And in 2017, China issued 225 billion USD, ranked second in the world.

2. The United States

America issued 16% of all green bonds in 2016, it's about 33 billion USD, 57% of the green bonds are in the transport theme, 23% in the water theme. In 2017, the amount of green bonds issued by America is 424 billion USD, ranked first issuer in the world.

3. France

The French government became the second-largest green bond issuer in 2017 with the issuance of 9.7 billion euro (10.7 billion USD) of sovereign green bonds, first issued in January 2017, with a scale of 7 billion euro (7.6 billion USD). It's the world's largest single green bond. The amount of green bond issued is 221 billion USD in 2017. It ranked third one in the world.

3.2.3 The Development Trend of Green Bond Market

In the past five years, global Carbon dioxide emissions remain stable, global warming limited to below 2 degrees Celsius. So the green finance will continue to develop.

As more and more governments want to finance climate-adaptive infrastructure and achieve their NDC commitments, sovereign green bond issuance in developed and emerging economies will increase. According to a new industry forecast by the rating agency Moody's, the global green bond issuance will increase by about 60% in 2018 to a total of 250 billion USD. Moody's said that this year's growth will develop at a health rate and far exceeds the 155 billion USD green bonds issued in 2017. Traditional sectors that play an important role in the growth of green bond issuance will maintain its importance in 2018. For example, financial and non-financial companies (accounting for 36% of total green bond issuance in 2017) will continue to be significant green bond issuers.

Organic market growth will result from increased awareness of the potential benefits of green bond issuance by issuers and other market participants, including investor diversification and commitment to sustainable development. In 2018, the issue of green bonds in emerging markets will increase, such as emerging market issuers, sovereign countries and municipalities. With the breakthrough development of sovereign green bond issuance in 2017, Moody's expects that sovereign green bonds in 2018 will continue to develop, including potential financing from the governments of Indonesia and Belgium. In addition to promoting sustainable development policies, the issuance of green bonds provides a strong signal that the government is committed to reducing carbon emissions under the Paris Agreement. Although there are still challenges in the financing of green bonds at emerging market, there is a huge potential for growth in the issuance, and overall growth will be mainly supported by China, India, and other economies that implement green finance policies. And multilateral agencies will also play a key role in supporting the development of green bonds in emerging markets (Moody's, 2018).

3.3 Issuance of Green Bond

As we all know in now days, green bond is very important. This part will focus on why should issuance green bond and how to issuance green bond.

3.3.1 The Importance of Green Bond

According to the Development of Green Bond report by CBI (2016), the importance of green bond can be summarized as follows:

- Green bond financing costs lower than ordinary bond

a) From the development of the international bond market, most of the issuers of green bonds are high-rated development financial institutions, large multinational companies and governments. Issuer's own credit allows green bonds to often enjoy lower issuance costs.

b) As the traditional energy industry and non-sustainable industries with high energy consumption and pollution are declining or restricted. Green, low-carbon and sustainable projects have been favored by the capital market. So that more and more investors will buy green financial assets.

c) Because green bonds often have public benefits, they can often enjoy special government support policies such as finance, taxation, franchise. Making the issue rate of green bonds lower than ordinary bonds.

- Issuing green bonds can better meet the needs of long-term financing

Because of green projects generally have a long cycle, the implementation of environmental and sustainability effects and their evaluation also require a long period. So the maturity of green bonds is generally longer.

- Help to optimize the structure of institutional investors

Some investment institutions with very significant long-term investment characteristics, such as sovereign funds, pension funds and other long-term investment institutions have become the main group to subscribe for green bonds. For green bond issuers, issuing green bonds will help optimize their investor structure.

- Finance plays a very important role in green economy transition

A systematic and efficient green finance system can attract private investment and enable to achieve growth in financial sector and economic and green development.

- Enhances an issuer's reputation

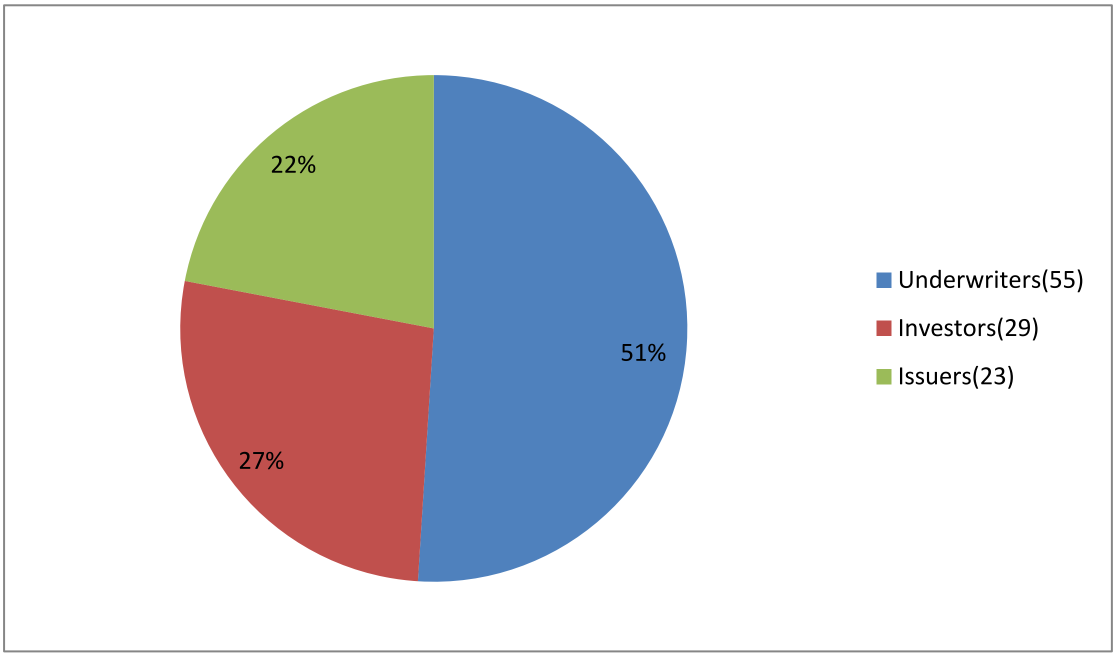
When companies issue a green bond, it tends to get a lot of attention, it helps in showcasing their commitment towards sustainable development. It also provides issuers access to specific set of global investors who invest only in green ventures.

3.3.2 The Participants of Green Bond Market

The distribution of participants in the green bond principle is reflected in two levels, one is a member who refers to entities that have participated in the issuance of green bonds. The other one is the observer, which refers to the organization that wants to participate in but not a member.

The three most important participants of green bond market are the issuer of green bond, investor and underwriter. The distribution of them is in the figure 3-3.

Figure 3-3 The members of GBP



Source: ICMA member firms & principal delegates, Author

There are some examples of major participants:

1. Underwriters: Bank of America Merrill Lynch (the United States), Citigroup (the United States), Rabobank (Netherlands), BNP Paribas (France), Credit Agricole Corporate and Investment Bank (France), HSBC (the United Kingdom), JP Morgan (the United States), Natixis (France), SEB (Sweden).
2. Investors: Amundi Asset Management (France), AXA Investment managers (France), BlackRock Inc. (the United States), California State Teachers Retirement System (the United States), KfW banking group (Germany), Teachers Insurance and Annuity Association-College Retirement Equities Fund (the United States), Zurich Insurance Group (Switzerland).

3. Issuers: Bank of China (China), EDF (France), European Bank of Reconstruction and Development (Europe), European Investment Bank (Europe), International Finance Corporation, Kommunalbanken Norway (Norway), Nordic Investment Bank (the five Nordic countries), World Bank.

3.3.3 Issuance Method and Process of Green Bond

Issuance method and process of green bond is an important part in the green bond market. The issuers need to comply with market rules, next there are seven steps for issuer to issue green bond in Chinese green bond market.

1. Audit financing plan

The issuer should review the basic business demand of the green bond, consider whether it matches the financing goals and sustainable development strategies. Then weigh the pros and cons for specific challenges. These specific challenges may include: issue and ongoing tracking, monitoring and reporting costs; stay close to ordinary bonds, including returns; reputation risk associated with ”washing green” allegations; the supervision of environmental certification is becoming increasingly rigorous; potential liquidated damages in violation of the green terms.

2. Select underwriter

Choose the right bond underwriter according the financing plan.

3. Formulate green bond standards and project screening process

There is no uniform standard for green bonds and the types of activities they can invest in. So issuers can refer to the Green Bond Principle, Climate Bond Standard and some national guidelines, green bond index, industry-specific guidelines to identify qualifying green projects and assets.

4. Use and management process and control measure for raised funds

Establish guaranteed management and control measures for the tracking and distribution of raised funds to ensure that the placement of raised funds is consistent with the bond terms. The following aspects should be considered when designing tracking mechanisms and processes: tracking raised funds; manage raised funds; manage unallocated raised funds; forensics.

5. Information disclosure

Include credit rating of bonds, presentation of information to investors, key commercial terms, completion of financial arrangements. Then arrange an independent review. After the verifiers who approved by CBI, issuers can apply for green bond certification under the Climate Bond Standard and Certification Scheme.

6. Issuing green bond

After complying with the relevant standards of the green project, passing the certification, issuer can issue the green bonds. Then conduct marketing and pricing of green bonds, the issuance process is similar to ordinary bonds.

7. Continuous report

Investors expect that the issuer regularly report on the distribution of raised funds and the environmental and social benefits of the project during the bond period or during the investment period. When disclosing the environmental impact of the underlying assets, the issuer should consider: pre-design monitoring and evaluation procedures; implement key performance indicators and data collection systems to monitor project environmental benefits; seek third-party assurance to reduce data quality risks, increase stakeholders' confidence with the report.

Furthermore, the Climate Bonds Initiative has a specific document on how to issue green bonds in China. In the document, it summarizes the five steps:

- Identify qualifying green projects and assets
- Arrange an independent review
- Tracking and reporting procedures
- Issuing your green bond
- Monitor use of proceeds and report annually

In addition, there are some other points need to be mentioned in the following:

a) All types of organizations can issue green bonds, without restrictions. The level of "greenness" of a company will not affect its eligibility for issuing green bonds. The issuer can be a supranational institution, private enterprise, bank or government.

b) As long as the assets meet the standards, bonds of any type or currency can be green bonds.

c) Loans and physical assets both can be used to issue green bonds. For example, the "Climate Awareness Bond" issued by the European Investment Bank. This bond is used for projects in the field of renewable energy and energy led by the European Investment Bank.

4 Assessment of the Green Bond Market Development in China

In this chapter, we will focus on the green bond market in China. The status of green bond development in China, the characteristic of green bond market, the participants of green bond market in China will be included. Next we will evaluate the development trends of green bond market in China.

4.1 The Development of Green Bond in China

Green finance has been listed in the most important national development strategies in China. The state council proposes setting up green finance system, including green credit, green stock indices, green funds and so on.

4.1.1 The Status of Green Bond Development

Financial regulators are promoting green finance with top-down approach. On April 23, 2015, the Green Finance Committee (GFC) was established in Beijing. Some local governments pay high attention to green finance development. Such as Guizhou province. More and more financial institutions and investors take environmental risks as a key element. Such as China's industrial bank, Industrial and Commercial Bank of China and some green funds (Yang, 2016).

In 2014, International Finance Corporation issued the World's first RMB green bond for China's green climate investment. In the same year, China General Nuclear Power Group, Wind Energy Limited has issued the first "Carbon Bond" in China. On July 18, 2015, the wind energy firm Xinjiang Gold wind Science and technology issued a 300 million USD green bond. It has three-years period, and coupon rate is 2.5%, which is the first real green bond of China (Li, 2015).

Next is why China needs the green bond:

1. The role of the Chinese bond market is increasing

With the development of China's financial market, bonds have become an important financing instrument. And green bond have a great effect on the financial, economic policy problem and environmental issues. Because it increases the financing opportunity to make China transform into a low-carbon and green economy.

2. China's transition to a low-carbon and green economy need more funds

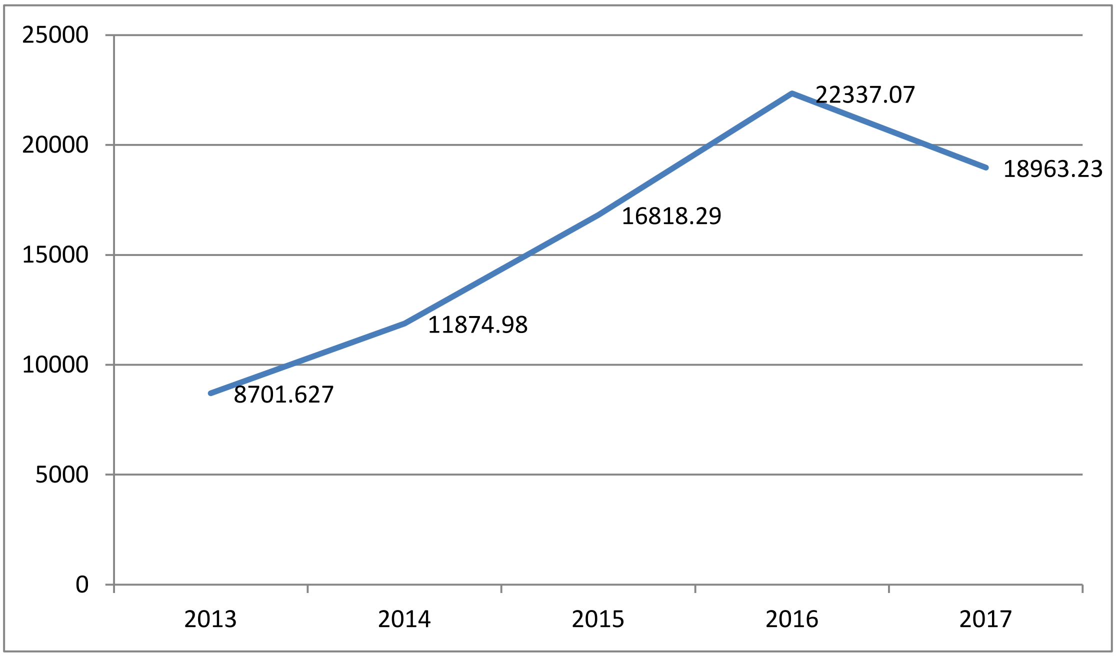
Development research center of the state council of China estimated that the investment of China's green industry will reach to at least 2 trillion Yuan annually in the next decade. So in order to meet the needs of green urbanization, the issuing green bond is necessary.

3. It fills the green investment gap and achieves non-environmental policy goals

Funds raised from green bonds will be used for green investment, such as green buildings, public transportation, water and energy. These projects require high capital to investment but they have a stable source of income. It's helpful for social progress.

The rapid growth of the Chinese bond market has increased the development opportunities for green bonds. There is the total bond issuance in China from 2013 to 2017 in figure 4-1.

Figure 4-1 Total bond issuance in China (billion Yuan)



Source: http://www.chinabond.com.cn/d2s/cbData.html, Author

From 2013 to 2016, the total bond issuance is on the rise, but in 2017, there is a slight decline. So next we will focus on the green bond market of China in 2017.

4.1.2 The Characteristic of Green Bond Market

Taking the situation in the year 2017 as an example, the characteristics of bond market in China can be described as following:

1. Bond market products are innovative and large

a) A large number of green bond innovation products emerged

On February 21, 2017, the China Development Bank issued the first phase of a 5 billion Yuan green bond, this bond will be used for the theme of air pollution prevention and control in the national interbank bond market. This is the first bond for air pollution prevention and control in China. On April 24, 2017, Beijing Enterprises Water Group (China) Investment Corporation Limited issued the first phase of green asset backed bills (ABN), the issue amount is 2.1 billion Yuan. On May 19, 2017, China Power New Development Corporation Limited issued the first single overseas non-financial company green panda bond. In addition, the green asset securitization project of the rail transit industry and the green short-term financing bills and other types of bonds are issued in 2017. This series of innovation products have enriched green financial products and broadened public participation in green investment channels.

b) Increase of the scale and types of poverty alleviation bond

To take targeted measures in poverty alleviation is the most important of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era. So the poverty alleviation bond will get strong support from all sectors of society.

c) Increase of special bond types

In August 2017, the National Development and Reform Commission issued the

Guidelines for the Issuance of Special Bonds for the Integration and Development of Rural Industries and the Guidelines for the Issuance of Special Bonds for the Industrial Sector in the Social Sector. It introduced these two special types of innovation bonds, to promote the role of corporate bond financing in the rural industries, social sectors, and the development of industries including health, pensions, education and culture.

2. The infrastructure and system construction of bond market in China are steadily advancing

a) Improvement of the bond market issuance management system

- Non-financial corporate debt financing system

In September 2017, the National Association of Financial Market Institutional Investors released a series of non-financial corporate debt financing instrument issuance related systems. These systems have strengthened the responsibilities of intermediaries and detailed information disclosure requirements.

- Regulators provide more policy support for green bond issuance

In March 2017, the China Securities Regulatory Commission issued the "China Securities Regulatory Commission's Guiding Opinions on Supporting the Development of Green Bonds", which promoted the convenience of companies issuing green corporate bonds. At the same time, the National Association of Financial Market Institutional Investors issued the "Guidelines for Non-financial Corporate Green Debt Financing Instruments", which regulates the issuance of green debt financing instruments and encourage various funds to invest in green debt financing instruments.

- Improvement of the convertible bond and exchangeable bond issuance system

b) Improvement of the bond market trading system

Implementing Exchange investor protection system. In June 2017, the Shanghai Stock Exchange and the Shenzhen Stock Exchange respectively issued the Measures for the

Administration of the Investors Suitability of the Shanghai Stock Exchange Bond Market and the Measures for the Administration of the Investors Suitability of the Shenzhen Stock Exchange Bond Market. They are clarifying the classification of investors in the bond market and all kinds of investors can participate in the range of bond products.

c) Strengthening local debt management practices

Specific measures include regulating local government debt, preventing local government debt risk in the field of corporate debt, improving local government management of specific bond.

d) Strengthen financial infrastructure construction

In December 2017, the China Government Securities Depository Trust and Clearing Corporate Limited set up branch offices at Shanghai. RMB bond cross-border issue center, RMB bond cross-border settlement center, China Debt Collateral Center, China Debt Financial Valuation Center and Shanghai Data Center all migrated to Shanghai, they are serve the global RMB bond market.

3. The bond market is expanding

a) Establishing the interconnection mechanism between the mainland China and Hong Kong China bond market.

On June 21, 2017, the Central Bank of China released the Interim Measures for the Management of Interconnection between the mainland China and Hong Kong Bond Markets.

b) Bond rating market open to the outside world

In July, 2017, the People's Bank of China issued the [2017] announcement No.7 to liberalize the credit rating business of overseas rating agencies in the interbank bond market.

c) "The Belt and Road Initiative" bond

On June, 24, 2017, the Bank of China issued 4 billion USD "the Belt and Road

Initiative” bonds. This is the first bond in the international financial market with the theme of “the Belt and Road Initiative”. The Silk Road Economic Belt and the 21st-century Maritime Silk Road or The Belt and Road Initiative (BRI) is a development strategy proposed by the Chinese government that focuses on connectivity and cooperation between Eurasian countries, primarily the People's Republic of China (PRC), the land-based Silk Road Economic Belt (SREB) and the ocean-going Maritime Silk Road (MSR).[12]

d) Restaring the issuance of overseas US Treasury bonds after 13 years later.

The Ministry of Finance of the People’s Republic of China has successfully issued five-year and ten-year sovereign bonds total 2 billion USD in Hong Kong. The U.S. dollar national treasury bonds have been subscribed for about 22 billion USD, and the five-year coupon rate is 2.125%, the ten-year coupon rate is 2.625% (Li, 2017).

4. The credit risk events are reduced

The size of defaulted bonds decreased but the types of them are increase. In 2017, there were 29 bonds in the bond market defaulted and the default amount was 16.282 billion Yuan. In 2016, 54 bonds defaulted and the default amount was 36.874 billion Yuan.[13]

4.1.3 The Participants of Green Bond Market

Next is about who can participate in the bond market of China, especially the green bond market.

The participants in China’s green bond market are basically the same as traditional bonds, the new participating institutions have not emerged yet. At present, China’s green bond issuance, underwriting, rating and auditing, transaction and circulation, settlement facilities are all based on the traditional bond system. Banks, brokers, market infrastructure, rating agencies, accounting firms are widely involved. And we

[12] https://en.wikipedia.org/wiki/One_Belt_One_Road_Initiative
[13] http://www.shxsj.com/uploadfile/kanwu/20180124-1.pdf

will focus on analysis of issuers and investors in this part.

1. Issuers

The issuer must comply with the bond issuance conditions of laws and regulations. The issuer's business scope or fund-raising project must be in accordance with the "Green Bond Support Project Directory" or "Green Bond Issuance Guidelines". Currently there are five types of green bonds in the capital market in China (Yang, 2016):

a) Green financial bond

This securities issued by a legal entity of a financial institution according to law. And the raise funds used to support the green industry and repay the principal and interest to the investors according to the contract. They are approved to issuance and supervision by the People's Bank of China.

b) Green enterprise bond

Funds raised are mainly used to support energy-saving and emission reduction technology transformation, green urbanization, clean and efficient use of energy, new energy development and utilization, circular economy development and so on project. The National Development and Reform Commission approves the issuance and duration supervision.

c) Green corporate bond

The corporate bonds issued on the exchange that support the raising of funds to support the green industry. It is approved to issue by exchange or the China Securities Regulatory Commission and is regulated by the China Securities Regulatory Commission.

d) Non-financial corporate green debt financing instruments

It is registered in the National Association of Financial Market Institutional Investors, issued and circulated in the national interbank bond market, the raise funds support for the green industry.

e) Green structured financing instruments

For example, green credit asset securitization, green project income equity asset support plan.

Based on the five major types of green bond, we can make the suggestions to the issuers:

- Financial institutions can issue green financial bonds and green credit asset-backed securities;
- Non-financial companies may choose to issue green corporate bonds, green enterprise bond, or green debt financing instruments. These issuers can choose their issuance method, public or private, and type of bond based on their own experience when they issuing bonds;
- Non-financial companies that have relatively stable cash flow green projects may also choose to raise public or private to establish green project income equity to support the green project financing.

2. Investors

Green bonds attract investors because of they often have fixed income, and they provide long-term financing for green projects and sustainable development. In general, investors of green bond have these characteristics: avoid investing funds in high pollution, high energy consumption project that destruction of the environment; concerned about the environmental benefits of investment more than financial benefits.

There are four aspects that should be considered by investors in green bonds market (Yang, 2012):

a) The standards of green project

Not only reference to the international green bond market standards, but also the China standards. The evaluation criteria of China's current green bonds are mainly the

“Catalog of Projects Backed by Green bonds” compiled by the China Securities Regulatory Commission on December 22, 2015. This is the first document that specifically defines and categorizes green bonds in China. It mainly sets out formal plans for the issuance of green financial bonds. On January 13,2016, the National Development and Reform Commission issued the “Guidelines for the Issuance of Green Bonds”. The definition of the issuance method, access conditions and scope of supporting projects for green corporate bonds are defined. In addition, the “Notice of the Shanghai Stock Exchange on Rolling out the Pilot Program concerning the Green Corporate bonds” by Shanghai Stock Exchange in March 2016 and “Notice of the Shenzhen Stock Exchange on Rolling out the Pilot Program concerning the Green Corporate Bonds” by Shenzhen Stock Exchange in April 2016, and the “Guiding Opinions of the China Securities Regulatory Commission on Supporting the Development of Green Bonds” by the China Securities Regulatory Commission in March 2017. They are also further supplemented the certification standards of green bond in China.

b) Initial information disclosure and expected use of funds

To better classify green bonds, investors need the issuer to be able to provide specific information before it is issued:

- Disclosure of the category of the specific green project belongs;
- the box used to determine which green projects can get the green bond funds;
- the criteria used to assess the environmental benefits;
- the issuers expect environmental impact by the project.

This special green project should provide clear, descriptive, assessable, quantifiable environmental benefits, and presented in the form of research, forecast of expected impact, internal research, and third-party assessment. The use of green bond funds should provide information about the proportion of funds raised for new projects and refinancing. Especially the projects that have already been financed before the issuer issues green bonds. And the issuer should also describe the management process after get the funds from green bond. It’s important for investors to know.

c) The report of use of funds and project impacts or benefits

After investing, investors hope that the issuer can provide the use of green bond funds, and the environmental impact and benefits of the projects supported by the green bond funds.

d) Independent certification assurance (extern review)

For investors, additional checks on the use of funds and the selection of qualified green projects will be helpful. Investors encouraged trusted auditors and climate and environmental governance institutions to provide independent certification for green bonds. The second party’s opinion with high credibility can further give green bond investor confidence in judging the green project selection and project environmental benefits.

4.2 Development Trends of Green Bond Market in China

In recent years, the Chinese green bond market has just started, so it faces many problems. To deal with these problems, Chinese government and all sectors of society and the various green market participants have responded positively. In order to solve problems faster and better, make sure the Chinese green bond market can continue to be steadily strengthened.

4.2.1 The Problems of Chinese Green Bond Market

There are so many problems need to face at this stage of green bond market in China. The operational mechanism and practical exploration of China’s green bond market have been gradually carried out. However, due to the limited external incentive policies and inadequate certification and supervision systems. The enthusiasm of green bonds to participate in environmental protection is still low. The development path and mode of the green bond market in China still need to be continuously explored and studied.

1. The government incentive policy is still insufficient

With the support of the People's Bank of China and other regulatory agencies, the Chinese green bond market has achieved rapid development. But the green bond market start late in China, so the market operation mechanism is imperfect, the external incentive policies is limited, substantial concessionary measures are not perfect. And assessment and certification before bond issuance, account supervision after obtain the funds, and information disclosure all of them have increased additional issuance costs. Companies are not enthusiastic about issuing green bonds. Moreover, green projects have the characteristics of large initial investment quotas and long term return periods. It is difficult for investors to obtain excess returns during the bond duration, the financial benefit and risk are not match, which reduces investor' s willingness to allocate funds for green bonds. Therefore, simply relying on the market for self-distribution to allocate private capital to green projects will be more difficult. The development of green bond market in China requires Chinese government and regulatory agencies to intervene with policies (Shi, 2011).

2. Certification system needs to be improved

The definition of the type of investment project is the key to judging whether the bond is "green". Whichever type of green bond, the criteria for entry into the green project should be the same. However, the current government departments and regulatory agencies' inconsistent recognition of green projects has inhibited the development of the green bond market. The People's Bank of China, the National Development and Reform Commission and the China Banking Regulatory Commission have formulated green project certification standards in their own systems, which have plagued the identification of "green project" for investors. In addition, the methods and systems of market certification and assessment agencies are diverse, the selection of assessment and certification indicators systems is not same. So there are some differences in the green levels given by different organizations in the same project. It will misleading investors' investment behavior. At present, there are differences in the standards for certification of green bonds between China and international institutions. Especially the relatively backward construction of the second party opinion or third-party certification system in China, also hinders the development of the Chinese green bond market.

3. Lack of effective supervision system

Green bond market as a new branch of the bond market, the development of it requires the introduction of regulatory policies. Not only unifying the definition of green bonds and the classification of projects, but also necessary to improve the system of accounts management. And unify the mandatory information disclosure system for green bonds, set entry criteria for second-party or third-party certification. Now the regulatory authorities have not put forward specific requirements for the investment of raised funds from the green bonds. Banks and other financial institutions have not conducted a comprehensive investigation of corporate environmental risks during the process of lending and borrowing. It can be said that only the superficial process has no substance. There are also insufficient disclosures of environmental information after the funds are put by enterprises. Qualitative descriptions are mostly, quantitative analysis is less, normative and timeliness of information disclosure is lack of effective supervision, which increases the risk of "green washing".

In addition to this, there are other problems such as weak environmental awareness of the general public; the conflicts between economic growth and environment protection in the short term; lack of motivation for green financial innovation.

4.2.2 The Measures to Develop Green Bond Market

Against the current problems in Chinese green bond market, the Chinese government and economic experts also have some measures to solve them. Summarized as follows:

1. Adhere to government guidance and improve the incentive mechanism

In the future, with the promulgation of regulatory policies, the enthusiasm of green bond issuers and investment institutions will be reduced. The development of the green bond market will require government guidance and policy incentives.

The government can appropriately reduce the threshold of green investment business of financial institutions and stimulate the participation by setting up industrial funds, simplifying the examination and approval procedures, credit guarantees.

The terms of government guidance, government guide funds can set up special funds with financial institutions to allocate capital to green bonds, and support the development of local green industries. Among them, the government guide fund can be used as inferior level to improve the financial security of financial institutions and stimulate market participation.

The terms of policy incentives, the risk weight and capital regulatory requirements of financial institutions for green bond-backed loans can be appropriately reduced. In addition, consideration may be given to not including the interest income from green bond investments on a tax base of personal income tax. Or implement similar tax exemption policies as buying government bonds to increase the investment enthusiasm of green investors.

The terms of simplifying the approval process, we can change the current examination and approval in succession system for green financial bond issuance to parallel examination and approval to shorten the examination and approval time. It will help financial institutions choose the best time to issue bonds, increase the flexibility of interest rate inquiry, and increase the efficiency of market operations.

The terms of credit guarantees, governments at or above the municipal level can set up local green bond guarantee funds to provide credit guarantees for the issuance of green bonds.

2. Increase of green investors and lead into long-term funds

Green investment and financing often face issues such as maturity mismatch, asymmetric information, imperfect information, and lack of products. Cause a challenge for investors to configure green bonds. The establishment of a multi-tiered green bond investor system, especially the introduction of institutional investors such as pension funds and social security funds, is particularly important for the development of green bond market. In practice, long-term funds can be lead into green projects through legal and institutional arrangements.

The regulatory agency may issue policies to require the green bond configuration of social welfare funds, such as giving 5% to 10% to the “labeled” green bonds. At the same time, it should appropriately relax the regulatory requirements for stock securities to balance the social and commercial benefits of green investment. In addition, appropriately reduce the threshold of green bonds to participate pledged repurchase at exchanges, increase the proportion of green bonds converted to standard vouchers. Provide financial institutions with more conditions to get the liquidity support from the Central Bank.

For the issuer, it is possible to increase investors’ willingness to invest by innovative types of product, attempt to issue convertible green bonds. And different types of environmental protection projects can also be packaged to reduce risks and attract green investor.

3. Unify green bond certification standards and build a green bond service system

At present, the market has reached a basic consensus on the concept of green bonds and the definition of green projects. However, the degree of improvement in the contribution of different projects to the environment is quite different, and the greenness and characteristics of different green bonds are also different. The establishment of green bonds unified recognition standards, the green rating of green bonds, the quantitative evaluation of environmental benefits, can help investors and related institutions to understand green bonds. Increasing the transparency of green bonds can also provide a reference for investors' investment activities.

In the future, it is necessary to unity the identification standards of green bonds in China, quantify the green rating of green bonds, improve the special account management system for the use of raised funds, rectify the non-standard behavior of disclosure of green bond information, and the introduction of market access standards and self-regulatory standards for market service agencies to make sure the healthy development of green bond market.

On this basis, we can compared the similarities and differences between the Catalog of Projects Backed by Green Bonds and the international green bond standards GBP and CBI in the industry and technology classifications. We will explore the green bond standards for mutual recognition between domestic and foreign countries, and increase the credibility of the domestic green bond market to promote cross-border capital flows.

4. Promote cross-border green bond investment and serve the development of green industries

In nowadays, the scale of green bond issuance accounts for less than 1% of the total Chinese bond market, which is far from meeting the needs of green development. Promoting overseas capital's participation in Chinese green bond market will help meet the demand of international investors for green bonds, and also will help the issuer to obtain low-cost funds.

But how to attract overseas capital to China's green bond market is facing a series of challenges. In particular, the cost of funds for overseas issuance of green bonds has no advantage over the domestic ones. The debt rating of overseas debt issuance, domestic and foreign legal fees, the trusteeship, underwriters of bond and other intermediary service fees are higher than senior unsecured bonds. So that reduced the enthusiasm of domestic issuers to issue green bonds overseas.

To this end, government must encourage domestic companies to go global, foster the awareness of domestic issuers of issuing bonds overseas, and encourage development banks and public companies to issue green bonds overseas. On the other hand, it is necessary to reduce the threshold of overseas capital investment in domestic green bonds, reduce the regulatory obstacles and costs when foreign investors entering the China's green bond market.

In addition, the issuer should innovation the types of product, including the issuance of green bonds for specific income purposes, green yield-guaranteed bonds for specific revenue purposes, and green asset-backed securities to increase the attractiveness of the Chinese green bond market.

And keep enhancing the environmental awareness of the general public and financial institutions is also necessary. In addition, the main policies of Chinese green bonds can be seen in Annex 1.

4.2.3 The Trend of Green Bond Market

The key elements for developing green bond in China include make clear the definition of green bonds and green projects; limit the use of green bond proceeds; strengthen the management of green bond proceeds; set up the third-party reviewer which provide for the third opinion or green certification; flexibly design the structure of green bonds; publish green bond incentive policies and supplementary supporting measures (Li, 2017).

Forecasting the green bond market in 2018 from the following aspects:

1. **Green bond supervision system will be more perfect and promotes the development of the green bond market in China**

In 2017, the "Guidelines for Non-financial Corporate Green Debt Financing

Instruments" published by the National Association of Financial Market Institutional Investors and its accompanying "Green Debt Financing Instruments Disclosure Statement" and "Green Evaluation Report Information Disclosure Sheet". The requirements for disclosure of information on green debt financing instruments have been clarified, and the comparability of information among different green bonds has been improved. The "Guidelines for the Assessment and Certification of Green Bonds (Interim)" published by the People's Bank of China and China Securities Regulatory Commission. It has made specific requirements for the institutional qualification, business acceptance, business implementation, report issuance and supervision and management of green bond assessment. It will substantially increase the normative nature of the development of green bonds and is expected to lead the green bond market into the fast track of sustained and healthy development. Through this series of measures, the supervision of issuers will be strengthened, effectively avoid the "green washing" risk. It is expected that the green bond policy guidance will be tend to be strengthened in the next five years. The responsibility of green bond issuers and the requirements for green bond will increase, and even become mandatory obligations.

2. The issuer of green bonds and the issuance area are more extensive, and the green development awareness of corporate will be improved

In 2017, the first single green bond was newly issued in 14 regions. The area of green bond issuance has reached 27 provinces and regions. The industry in which the issuer is located is also diversified. In the demonstration effect of the pilot of green financial reform in five provinces (Zhejiang province, Jiangxi province, Guangdong province, Guizhou province and Xinjiang province) and the efforts of all regions to actively participate in green financial innovation, the region for issuing green bonds will continue to expand. In central and western of China, there will be more companies trying to finance through green bonds. At the same time, it is expected that the green bond issuer will achieve two changes in the future: on the one hand, the main issuer of green bonds will be transformed from large banks to local commercial banks and rural commercial banks. This transformed will support the green transformation and development of more small- and medium-sized enterprises. On the other hand, more entity companies will actively participate in the issuance of non-financial corporate green bonds and achieve direct support of green funds for green projects.

Figure 4-2 The types of green bond issuers in 2017

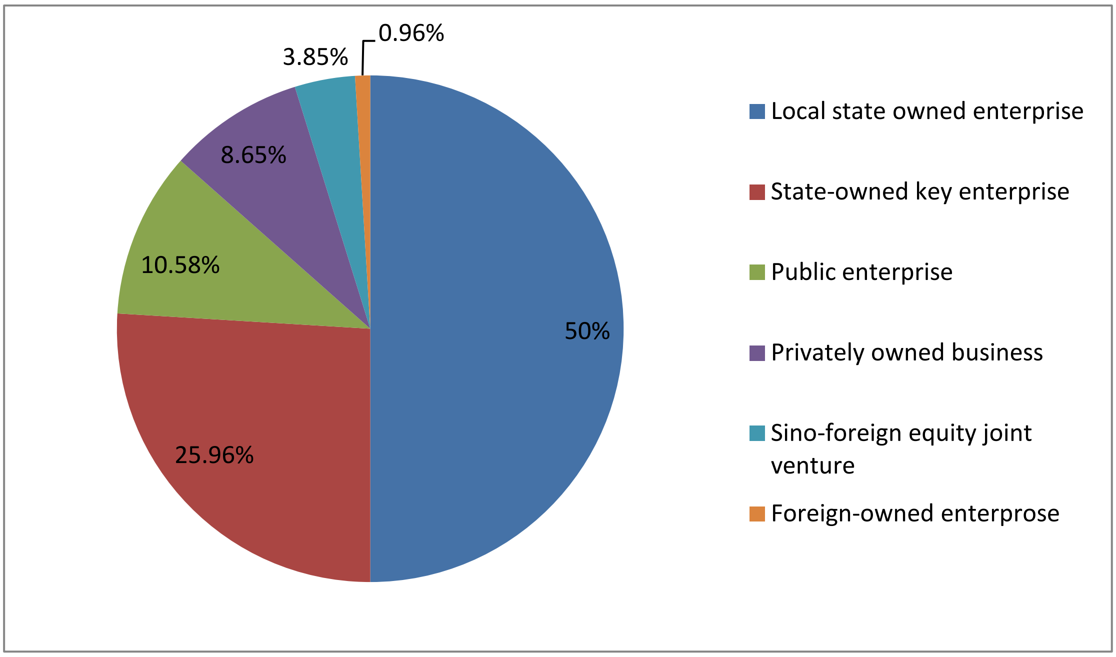
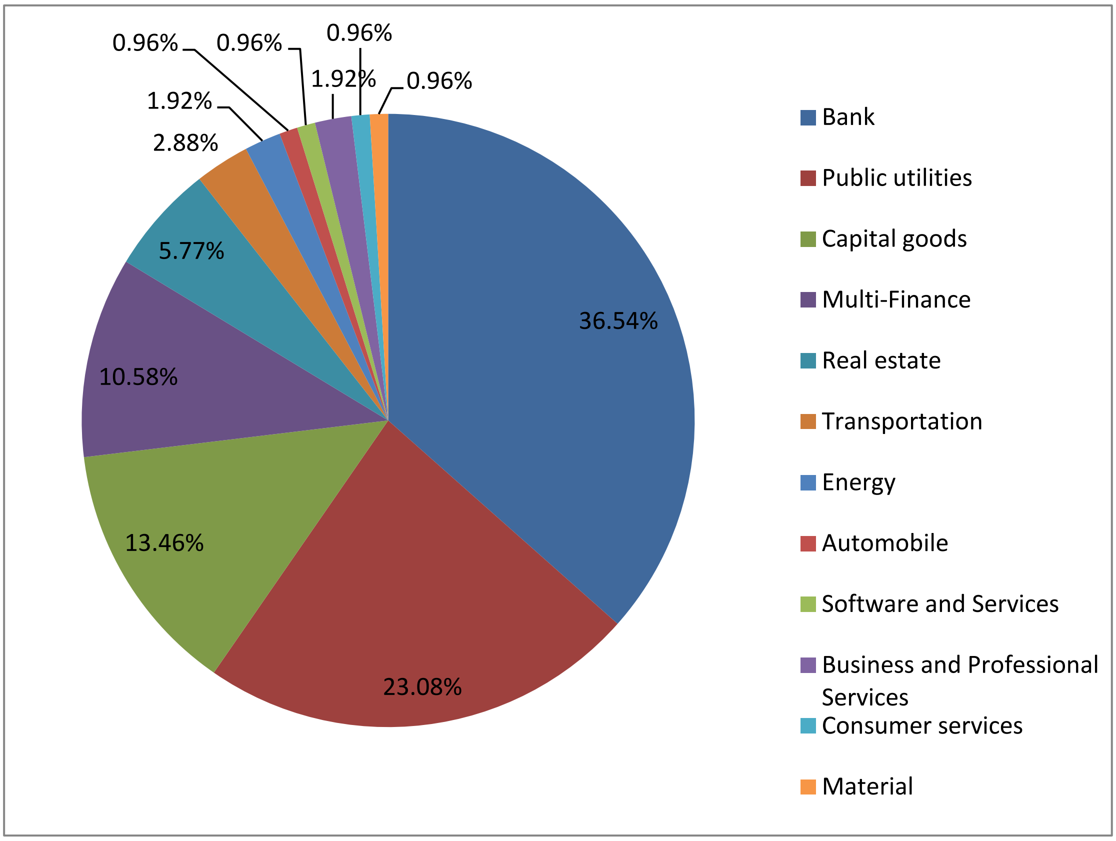


Figure 4-3 The distribution of green bond issuers industry in 2017



Source: http://finance.sina.com.cn, Author

The figure 4-2 and figure 4-3 is the types of Chinese green bond issuer in 2017, and there will be more types in the future.

3. The types of green bonds are diversified and meet the financing needs of different green bond issuers

According to the development of green bond in 2017 (table 4-1), the future green bond innovation will attract more and more issuers' attention. The circulation of bonds such as green short-term financing bonds, green asset-backed securities, green asset-backed medium-term notes will continue increase. So that to meet the financing needs of different green bond issuers. And the scale of overseas green bonds issued by domestic entities and the issue of domestic green Panda bonds by overseas entities will continue increase. It services for the China's green bond market and the "the Belt and Road" project. It also further enhances the international influence of China's green bond market and become an important force in the global green bond market.

Table 4-1 The types of green bond issued in Chinese green bond market in 2017

The types of green bond	The number of green bond (pc.)	Proportion of total green bond
Green financial bond	44	38.6%
Green corporate bond	26	22.8%
Green enterprise bond	21	18.4%
Green medium term note	7	6.1%
Green private placement note	5	4.4%
Green commercial paper	1	0.9%
Green asset-backed security	8	7.0%
Green asset-backed medium-term note	2	1.8%

Source: www.wind.com.cn, Author

In summary, the trend of green bond market in China will continue to maintain a healthy development in the future, with a huge development space.

4.3 Comparative Analysis of Selected Chinese Green Bonds

In this part, it will focus on the specific bonds to analysis their data. Take the EUR-dominated green bond issued by China Three Gorges Corporation in 2017 and the dual currency bond issued by China Three Gorges Corporation in 2015 as examples. Then comparative analysis by their issuer, issue size, maturity, coupon rate and subscription ratio will be used to evaluate the selected bonds from the point of view of potential investors.

4.3.1 The Introduction of China Three Gorges Corporation

With the approval of the State Council of the People's Republic of China, to build the Three Gorges Project and develop the Yangtze River, the China Three Gorges Project

Corporation was established on September 27, 1993. And it was renamed the China Three Gorges Corporation on September 27, 2009. The China Three Gorges Corporation is wholly state-owned enterprises, the registered capital of 149.5 billion Yuan.

China Three Gorges Corporation is fully responsible for the construction and operation of the Three Gorges Project. The Three Gorges Project was started on December 14, 1994. On November 8, 1997, the river closure was successfully realized. In 2003, the three goals of water storage, navigation and power generation for the second phase of the project were realized on schedule. In 2009, the preliminary design and construction of the Three Gorges Project was completed, and the acceptance of 175 meters line of water storage was passed. And the company transfer from construction-oriented to operating-oriented. In 2010, the Three Gorges Reservoir successfully filled water to 175 meters. This means the Three Gorges Project's flood protection, power generation, navigation, replenishment and other functions have reached the design requirements. It began to fully play its comprehensive benefits.

Although the issuers of green bonds do not need to think about their own degree of greenness, but the China Three Gorges Corporation is very suitable for issuing green bonds. In the past 20 years, the China Three Gorges has issued multiple bonds. For example domestic enterprise bond, overseas enterprise bond, green bond, dual currency bond. The China Three Gorges Corporation continues to innovate, make process in finance and make a great contribution to environmental protection. [14]

4.3.2 The EUR-Dominated Green Bond

The EUR-dominated green bond issued by the China Three Gorges Corporation is the first EUR-dominated green bond in China. After 10 days of roadshows in 8 cities, on June 14, 2017, the China Three Gorges Corporation successfully completed the pricing of 650 million EURs of seven-year green bonds in Irish Stock Exchange.

[14] http://www.ctg.com.cn/sxjt/jtgk/_301098/index.html

There is the basic information of this bond in table 4-2.

Table 4-2 The basic information about EUR-dominated green bond issued by the CTG

EUR-dominated green bond issued by the CTG			
Issuer	China Three Gorges Corporation	Issuance time	14.6.2017
Type of bond	Green bond	Listed place	Irish Stock Exchange
Issue size	650 million EUR	Bond maturity	7 years
Coupon rate	1.3%	Subscription ratio	3.1
Rating	A1/A+	Rating agencies	Moody’s and Fitch

Source: China Finance Information Network –green financial http://greenfinance.xinhua08.com, Author.

As we can see, the subscription ratio is more than 3, it means the demand of this bond is huge. And rating agencies are recognized in the world. The rating is A1/A+, it means the company has good reputation and has the ability to pay. According to the meaning of credit rating grade (Annex 2), we can know the risk is only 10% to 15% and the issue can be considered as an investment grade bond.

In addition, the joint-global coordinators of this green bond are Deutsche Bank, JP Morgan and Bank of China. The joint-book runners are Union Bank of Switzerland AG, Industrial and Commercial Bank of China, Standard Chartered Bank, Natixis Bank and CCB International.

The most important of green bond is the raised funds will invest into what project. For this bond, the funds raised will be used into Wind Power in Germany and ENEOP Wind Power project in Portugal. It’s also the first Chinese green bond to gain certification under the Climate Bonds Standard. So the bond issuance has attracted so many investors from Germany, France, Switzerland, UK, Italy, Norway, Netherlands, Portugal, Spain, UAE, Singapore, South Korea, Japan and Malaysia.

And Ernst & Young has provided an external review and issued an Assurance Report on the issuance. This also strengthens investors' investment confidence.

4.3.3 The Dual Currency Bond

The dual currency bond issued by the China Three Gorges Corporation is also one of the bonds with a breakthrough representative. The basic information of this bond is table 4-3.

Table 4-3 The basic information of dual currency bond issued by CTG

Dual Currency Bond issued by CTG			
Issuer	China Three Gorges Corporation	Issuance time	10.6.2015
Issue size	700 million USD 700 million EUR	Bond maturity	USD: 10 years EUR: 7 years
Coupon rate	USD: 3.7% EUR: 1.7%	Subscription ratio	7
Rating	Aa3/A+	Rating agencies	Moody's and Fitch

Source: CTG news,

http://www.ctgpc.com/sxjt/xwzx/ttxw/529110/index.html, Author.

The subscription ratio is more than 7, so the demand of this bond is very huge. The investors are from different types and different regions, such as Europe, American and Asia. And the rating is Aa3/A+, it is investment grade. According to the Annex 2, the risk is only 5% to 10%.

In addition, the joint-global coordinators of this green bond are Deutsche Bank, JP Morgan and Industrial and Commercial Bank of China. The joint-book runners are Goldman Sachs (Asia), Bank of China, Corporate & Investment Banking, CCB

International, CITIC CLSA Securities.

The key points of issuance this dual currency bond:

- In June 2015, the China Three Gores Corporation successfully issued USD 700 million for 10-year bond in the United States and EUR 700 million for 7-year bond in Europe at the same time.
- The China Three Gores Corporation became the first Chinese company to issue dual currency bonds simultaneously into the global capital market.
- International rating agencies and investors highly praised the great achievements made in the construction of the Three Gorges Project and the efficient operation over more than ten years.
- For the company itself, the issuance of this bond has established China Three Gorges Corporation's benchmark position in the international capital market. It has obtained the same rating as the national sovereign credit rating. In parallel with the state-owned emprises such as the China Petroleum and Chemical Corporation, China National Offshore Oil Corporation and State Grid Corporation of China.

4.3.4 Comparison of the Bonds

The basic information of the EUR-dominated green bond and the dual currency bond issued by the China Three Gorges Corporation are in the table 4-2 and table 4-3. In this part, we will put them together to make a comparison.

1. Issuer

These two bonds are issued by the China Three Gorges Corporation, so the default risk for investors is almost same. And this company has a good reputation, the solvency is also good. So the default risk is small. And the balance sheet, income statement, cash flow statement of China Three Gorges Corporation can be easily found in the Shanghai Clearing House website. The company's disclosure of information is very clear; investors can find the relevant information before buying bonds to decide whether to buy them.

2. Issue size

The issue size of EUR-dominated green bond is 650 million EUR. And the issue size of dual currency bond is 700 million USD, 700 million EUR. As we can see, the dual currency bond is bigger than the green bond. Generally, the size of issue is not a standard that affects the quality of bond.

3. Maturity

The maturity of EUR-dominated green bond is 7 years, the maturity of dual currency bond is USD-10 years, EUR-7 years. In general, the longer the time to maturity, the higher the interest rate. But it also will have more investment risk. The economic market will have some fluctuation. The bonds have default risk, inflation risk, interest-rate risk, if investors holding periods longer and the interest rate is fixed, the inflation risk will be increase. Because investors do not know what the inflation rate will be.

4. Yield to maturity

The coupon rate of EUR-dominated green bond is 1.3%, the coupon rate of dual currency bond is USD-3.7%, EUR-1.7%.

- A formula for calculating the approximate yield to maturity:

$$\mathrm{YTM} = \frac{\mathrm{C}+\frac{\mathrm{F}-\mathrm{P}}{\mathrm{n}}}{0.6\times\mathrm{P}+0.4\times\mathrm{F}} \tag{4.1}$$

The C in formula (4.1) is coupon; F is face value; P is purchase price; n is maturity of bonds. Investors can according this formula to calculating the yield to maturity, then decide which bonds they want to buy. For example, assuming face value is 1000, and purchase price of green bond is 948. So the YTM of this green bond is 2.108%. Assuming the condition is the same, the YTM of USD bond is 4.586%, and the YTM of EUR bond is 2.522%.

- A formula for calculating the accurate yield to maturity:

$$P = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} + \frac{F}{(1+r)^t} \tag{4.2}$$

Where the P is price of bond, C is coupon payment, F is par value, t is years to maturity, r is YTM. The face value and current price are same as above; we can see the table 4-4.

Table 4-4 Calculating the YTM in Excel

	EUR-dominated green bond	Dual currency bond-USD	Dual Currency bond-EUR
Par value	1000	1000	1000
Coupon rate	1.3%	3.7%	1.7%
Coupon per year	2	2	2
Years to maturity	7	7	7
Current price	948	948	948
Rate	2.103%	4.577%	2.515%

Source: CTG, Author

According to table 4-4, we use the rate formula and yield formula in Excel to calculate the Yield to Maturity of them.[15]

So the biggest is USD currency bond, next is EUR currency bond, the smallest is EUR green bond. But actually, there are so many variables in the financial market. This also precisely reflects the characteristics of green investors concerned about the environmental benefits of investment more than financial benefits.

5. Subscription ratio

The subscription ratio of bond is bigger, the bond is better (Zhang, 2008). Because the higher subscription multiple indicates that the market and investors is more interested

[15] https://www.investopedia.com/ask/answers/012015/how-do-i-calculate-yield-maturity-excel.asp

in this bond. The dual currency bond is 7, the EUR-dominated green bond is 3.1. This does not mean that green bond is not popular. Green bond is new product in the bond market, investors are lack of green awareness especially in China. Moreover the 3.1 subscription ratio is not low. The demand of investors is good.

In these two bonds, no one is better and no one is worse. Investors only need to invest according to their own needs. As a new type of bonds, Chinese green bond market needs to be continuously improved. Because there are so many investors take a wait-and-see attitude. Only improve the development of green bond market, and encourage the issue of green bonds, popularize green knowledge to the public, improve investors' environmental awareness, really make the people think of pubic environmental issues as their own, then the Chinese economy and environment can both win.

5 Conclusion

Based on the basic theories of the bond market and green bond market, the development of Chinese green bond market described in this thesis, and comparison of green bond and dual currency bond issued by the China Three Gorges Corporation, we can evaluate the current bond market in China, the policy and development of the Chinese green bond market. Chinese green bond market has grown rapidly, relevant policies and regulations have been continuously improved, bond issuance structure has been gradually balanced, information disclosure has been strengthened, third-party certification has been standardized, and the international cooperation has continued to advance. All of these have promoted the sustained and healthy development of Chinese green bond market and better served the green development of the real economy.

Prior to 2016, the Chinese green bond market was only an exploratory stage of development. It officially launched until 2016. Developing green bonds is an inevitable requirement for economic development, the extensive development mode of the Chinese economy over the past 30 years has been constrained by the scarcity of resources and environmental pollution. Serious environmental pollution and ecosystem degradation, the carrying capacity of resources and ecological environment is approaching the limit. The development of green bonds can help solve corporate financing difficulties and expensive financing issues. Traditional financing instruments have certain objective defected, they are difficult to meet the huge financing requirements of companies. Energy-saving and environmental protection projects have complex technologies and long investment cycles. Green bonds can meet the needs of investors, compared with the ordinary bonds, green bonds have more stringent information disclosure requirements, allowing investors to use a low-risk approach to invest funds in green projects. Investors get a certain amount of income at a lower risk and fulfill their social responsibilities. Meet their diverse investment needs.

In recent years, the scale of Chinese green bond issuance reaches the world's leading position, ranking first in the world in 2016, and ranking second in the world in 2017. Among them, the United States, China and France account for 56% of global total green bond issuance. Since the launch of Chinese green bond market in 2016, as of the end of 2017, a total of 184 green bonds have been issued within and outside China, with a total issue circulation is 479.9107 billion Yuan, accounting for about 30% of the global green bond issuance during the same period. Among them, 167 were issued in domestic and the total number of issuers reached 409.7107 billion Yuan.

However, with the continuous expansion of the Chinese green bond market, there are also some problems. At present, there is still the challenge of the inconsistency of green project standards, the need to further standardize the certification system, and the transparency of information disclosure. The Chinese government, regulatory agencies, financial institutions and all sectors of the community are also working hard to make sure the healthy development of Chinese green bond market and occupy a place in the international green bond market.

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List of Abbreviations

CBI: Climate Bonds Initiative

CCDC: China Central Depository & Clearing Corporate Limited

CTG: China Three Gorges Corporation

GFC: Green Finance Committee, China Society for Finance & Banking

ICMA: International Capital Market Association

NAFMII: National Association of Financial Market Institutional Investors

NDRC: National Development and Reform Commission

PBC: People's Bank of China

SSE: Shanghai Stock Exchange

SZSE: Shenzhen Stock Exchange

WSJ: The Wall Street Journal

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Ostrava dated 04. 05. 2018

杨茜茹 Qianru Yang

Qianru Yang

List of Annexes

Annex 1 The Main Policies of Chinese Green Bonds

Release date	Institution	Document	Document number
22.12.2015	PBC	Notice of issuance of green bonds related to financial matters	PBC [2015] No. 39
22.12.2015	GFC	the Catalog of Projects Backed by Green Bonds	
31.12.2015	NDRC	Notice of the issuance of 'green bonds issued guidelines'	NDRC [2015] No. 3504
16.3.2016	SSE	Notice of the Shanghai Stock Exchange on Rolling out the Pilot Program concerning the Green Corporate bonds	SSE [2016] No.13
22.4.2016	SZSE	Notice of the Shenzhen Stock Exchange on Rolling out the Pilot Program concerning the Green Corporate bonds	SZSE [2016] No.206

Source: PBC, GFC, NDRC, SSE, SZSE, Author

Annex 2 The Meaning of Rating Grade

Moody's	S & P	Fitch	Rating description	Risk
Aaa	AAA	AAA	Prime	<5%
Aa1	AA+	AA+	High grade	5-10%
Aa2	AA	AA		
Aa3	AA-	AA-		
A1	A+	A+	Upper medium grade	10-15%
A2	A	A		
A3	A-	A-		
Baa1	BBB+	BBB+	Lower medium grade	15-22%
Baa2	BBB	BBB		
Baa3	BBB-	BBB-		
Ba1	BB+	BB+	Non-investment grade speculative	22-30%
Ba2	BB	BB		
Ba3	BB-	BB-		
B1	B+	B+	Highly speculative	30-45%
B2	B	B		
B3	B-	B-		
Caa1	CCC+	CCC+	Substantial risks	45-62%
Caa2	CCC	CCC		
Caa3	CCC-	CCC-		
Ca	CC	CC	Extremely speculative	62-80%
	C	C	Default imminent	
C	RD	DDD	In default	80-100%
/	SD	DD		
/	D	D		95-100%

Source: https://en.m.wikipedia.org/wiki/Credit_rating, Author